

CLAIMS

1. A voltage regulator comprising:

an input terminal for receiving an input voltage;

an output terminal coupled to a load;

5 a first switch for selectively coupling said input terminal to said output terminal;

a current sensor for measuring an output current flowing towards said output terminal;

10 a voltage sensor for measuring an output voltage on said output terminal;

a digital controller coupled to said first switch, which closes said first switch when an error voltage, obtained by subtracting from said output voltage a constant reference voltage, is less than a preset first value of voltage, and opens said first switch when said output current is greater than a preset first value of current.

2. The voltage regulator of claim 1 wherein said error voltage is obtained by subtracting from said output voltage a constant reference voltage and a variable ramp voltage.

3. The voltage regulator of claim 1 wherein said first value of preset voltage and said first value of preset current each comprise a plurality of discrete levels.

4. The voltage regulator of claim 1 wherein said first value of preset voltage and said first value of preset current are linked to each other through a preset function.

25 5. The voltage regulator of claim 1 wherein said first value of preset voltage and said first value of preset current are linked to each other through a linear function.

6. The voltage regulator of claim 1 wherein said first value of preset voltage and said first value of preset current are linked to each other through

a linear function at times comprising at least two different slopes.

7. The voltage regulator of claim 1 wherein said first value of preset voltage and said first value of preset current are linked to each other through a function comprising an integral component and a linear component.

5 8. The voltage regulator of claim 1 wherein said first value of preset voltage and said first value of preset current are a function of the switching frequency of said first switch.

10 9. The voltage regulator of claim 1 wherein said first value of preset voltage decreases by a second value of preset voltage and wherein said first value of preset current increases by a third value of preset current when the driving frequency of said first switch is greater than a first preset frequency value.

15 10. The voltage regulator of claim 1 wherein said first value of preset voltage increases by a fourth value of preset voltage and wherein said first value of preset current decreases by a fifth value of preset current when the driving frequency of said first switch is less than a second preset frequency value.

11. The voltage regulator of claim 1 further comprising a second switch for selectively coupling said output terminal to ground.

20 12. A multiphase voltage regulator comprising:
at least two voltage regulators coupled to the same load,
wherein each regulator comprises a slave digital controller coupled to a first switch coupled between a regulator input and a regulator output, which closes when an error voltage derived from a regulator output voltage is less
25 than a preset voltage value, and opens said first switch when a regulator output current is greater than a preset current value; and
a master controller coupled to each of the slave controllers.

13. The multiphase voltage regulator of claim 12 wherein the master controller further comprises an input for receiving the output voltage present

on said load.

14. The multiphase voltage regulator of claim 12 wherein the master controller supplies a turn-on signal to said at least two voltage regulators.

5 15. The multiphase voltage regulator of claim 14 wherein said turn-on signal is sent in succession to said at least two voltage regulators.

16. The multiphase voltage regulator of claim 14 wherein said turn-on signal is sent to the regulator of said at least two voltage regulators that supplies the least current, compared to the other, to said load.

10 17. The multiphase voltage regulator of claim 12 wherein the master controller supplies a peak current signal to said at least two voltage regulators.

18. The multiphase voltage regulator of claim 12 comprising three voltage regulators.

15 19. The multiphase voltage regulator of claim 12 wherein voltage regulator further comprises a second switch for selectively coupling said regulator output to ground.

20. The multiphase voltage regulator of claim 12 wherein said master controller further comprises an input for receiving a reference voltage.